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S M O K E R I N G S

Our Cover Picture

● OUR PICTURE this week shows an operation in the manufacture of steel. Some of the most spectacular effects in industrial processes are associated with this industry.

When sharpening grinding tools on an emery wheel, I have often observed that the sparks appear to make a long trail through the air, and then to burst and continue again; or sometimes they burst and disappear. Without giving much thought to the matter, I had assumed that the trail was an optical illusion, created by the high speed of the moving red-hot particle of material. A picture such as I have used this week, however, proves that I am quite wrong, and there does exist a definite tail to the main body of the spark, presumably consisting of red-hot particles breaking away from it in its flight, possibly in the manner of a miniature comet.

Perhaps some of the metallurgists among our readers could explain this phenomenon.—P.D.

From the West Riding

● THE WEST RIDING Small Locomotive Society very kindly send me each month a copy of their news-sheet. From the latest one to hand, at the time of writing, I learn one or two items of interest. In the first place, the Society's entry for the " Club Cup " Competition at the forthcoming MODEL ENGINEER Exhibition will consist of: Mr. J. M. Crowther's $7\frac{1}{4}$-in. gauge 0-4-0 " Midge," Mr. W. Lynch's 5-in. gauge 2-6-2 " Green Arrow " and, of course, Mr. W. D. Hollings' 0-6-0 " Dock Shunter." This is a formidable group for other clubs to compete against and, I believe, the only one in which all the entries are locomotives.

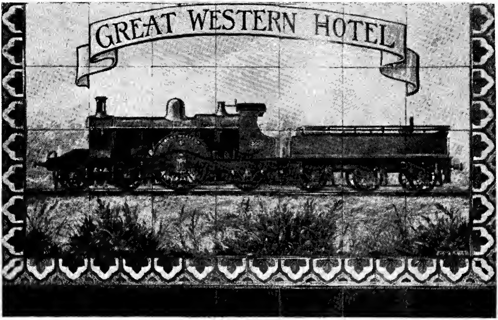
Another interesting piece of news is the announcement of the special ceremonial meeting planned for July 10th, to mark the casting of the last concrete arch for the completion of the foundations for the Society's 220-yard circular track at Blackgates. I hope to hear more about the proceedings at this ceremony, because of their unusual nature; and I also hope that the filming of it was successful. The official opening of the completed track will take place, if all goes well, early next year.—J.N.M.

A Good Rule

● I HAVE lately received a copy of the list of rules of the Harrow and Wembley Society of Model Engineers, and I am particularly pleased to note Rule 2, which reads: " The aims and

object of the Society shall be to further the interests and good fellowship of model engineers. The Society shall encourage and support any other society which seeks its aid in promoting and furthering the model engineering movement."

This shows the right spirit, and one which I happen to know is prominent in most other societies. But I cannot recall any other set of rules in which the encouragement and support of other societies is definitely specified, and I would like to suggest that any other society which has not got a rule to the same effect, definitely stated, should add one at the earliest opportunity. I feel that it would be a graceful compliment to the memory of the late Mr. Percival Marshall who, during his long association with the hobby for which he did so much, worked unceasingly towards the realisation of the ideal expressed in the rule I have quoted.—J.N.M.



"Great Western" Again

● ONE OF the most surprising things about "Smoke Rings" is that whenever something unusual is mentioned, or reference is made to some matter about which little is known, some reader is bound to write in giving additional interesting and often useful information. The most recent instance of this sort of thing is my reference to the picture of G.W.R. locomotive No. 3012, *Great Western*, executed in coloured tiles, in the Great Western Hotel at Swindon.

A day or two after my comments were published, I received a letter from Mr. J. R. Clarke, of Brixton, enclosing a photograph, reproduced herewith, showing this interesting piece of mural decoration. The photograph was taken by Mr. W. Clarke, brother of my correspondent, and, if I remember rightly, I was present when he did it, though I never knew till now if the result was satisfactory.

In the bottom left-hand corner is the artist's name, "W. Lambert," and the date "1897," while on the other side is the legend "G.W. & S. Ltd." The drawing of the engine is very good and reasonably accurate, and the colouring leaves little to be desired. As I stated in my previous note, this tile-portrait is thought to be unique; certainly I do not know of another like it.—J.N.M.

So it was Black!

● THE RECENT "Smoke Rings" on the subject of the colour of the main frames on the L.B. & S.C.R. passenger engines, in the days when Stroudley's style of painting was in use, have brought me some friendly letters. The original note and "L.B.S.C.'s" reply to it were published while I was away on holiday; but that doyen of "Brighton" enthusiasts, Dr. J. Bradbury Winter, wrote to say that he was fairly certain that black was the correct colour, though he suggested that a visit to his *Como* in the museum at Brighton would clear the matter right up. I had already asked Mr. G. H. Davis of the Brighton Society of Model Engineers if he could arrange to inspect *Como* on my behalf, and I was awaiting his report which, when it came, gave black as the colour of the frames! In view of "L.B.S.C.'s" remarks and the evidence of *Como*, I accept the verdict—black though it is! But the whole episode has shown how frail human recollection can be, and how easily one can be misled. My own opinion favoured maroon frames; but presumably, I have been a victim of that malady which, in modern times is described as "wishful thinking."—J.N.M.

"COSMO BONSOR"

A Remarkable Performance

Photo by] [*E. T. Westbury*

First Again!

AT the recent S.M.E.E. exhibition this model locomotive, which was the first to take passengers at the first MODEL ENGINEER Exhibition, and was first shown under steam in 1903 at a meeting of the Society—was selected to be given the honour of being the first locomotive to be tried out on the new test apparatus. It was shown running on test for three days.

The first day, it gave a drawbar pull of 9 lb. before slipping, and would have shown more, as there was plenty of power in reserve; but the apparatus was new, and the contact between the coupled wheels and rollers was limited.

On the second day a period test was carried out. The regulator was opened at 11.10 a.m. and was not closed until 8.50 p.m.—a non-stop run of 9 hours 40 minutes. The relay drivers were: Messrs. Storey, W. H. Hart, Maxwell, Vicarage and Mayes.

On the third day towards the end of the engine's run, a speed test was carried out, when it astonished those in charge of the test, by reaching a speed of $15\frac{1}{2}$ miles per hour. Mr. R. P. Mayes was the driver in charge of the locomotive at the time.

The total mileage for the three days was $64\frac{1}{2}$, and all these figures have been accurately recorded. The model had not been prepared in any way for the test and, in fact, was due for an overhaul.

The boiler is the original, built in 1901, is riveted and soft-soldered, yet showed no trace of any leak. The coupled wheels are $4\frac{3}{4}$ in. in diameter and cylinders $1\frac{1}{4}$ in. by $1\frac{1}{2}$ in. stroke. At speed, the running was very steady. "Cossy" has always been a favourite with its drivers, and this remarkable performance has added lustre to its fame.

[*Editorial Comment*: One wonders what the performance would have been if the engine had remained in its 4-cylinder compound 4-4-2 form! "Cossy," as it is affectionately known, has always been an interesting engine, but never more so than it is today. The $4\frac{1}{2}$-in. gauge, however, mitigates against a test on a continuous track, simply because there does not appear to exist a continuous track of that gauge. In view of the performance quoted above, this is a pity.]

*A 35-mm. ENLARGER

by "P.B.D."

A description on constructing a photographic enlarger designed to enable a miniature camera to be used for the projection lens

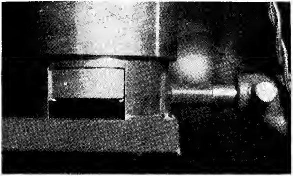
IT might be as well to mention here that the camera I use and around which I designed this enlarger, is a Kodak "Retina," with a F/3.5 "Xenar" lens, and to use this in conjunction with the enlarger, the back of the camera is opened and the instrument slung under the baseplate and secured with the two elastic bands, as shown in the arrangement. With a slight modification the baseplate can be made to take practically any other model of a 35-mm. camera that uses a lens of 5-cm. focal length.

Before outlining the various parts I should like to comment, briefly, on the arrangement of the enlarging head shown here. It will be seen that the negative is carried on a cylinder, which moves inside the tube that constitutes the body. In order to focus the negative, the cylinder can rise and fall vertically by virtue of the focusing ring. This method of focusing offers smooth and fine adjustment, provided the workmanship is up to the mark. It is intended that the usual 36-exposure roll of negatives should be cut into not less than 18-exposure lengths in order to cut down time lost due to having to change negatives frequently. With this method, negatives can be changed immediately one exposure has been made. Another advantage is that due to the strips of negatives being constantly guided in the slides, re-centralising of the masking frame on the baseboard is unnecessary.

In the details I don't think any difficulty should be experienced as far as machining and pattern-making are concerned, I have tried to make them as self-explanatory as possible. Briefly the details are as follows:

1. Finned Head

This is preferably an aluminium casting for lightness. A pattern was turned up in the lathe and a small core-box made to take a little material out of the centre. This finned head serves two purposes, it helps to keep the whole job cool, and also adds a little class to the finished product. It will be seen that eight $\frac{5}{16}$ in. holes have been put in the base for ventilation, some readers would probably think that these should have been baffled to prevent fogging of the bromide paper by stray light. After experimenting and making some hundreds of enlargements I find that the bromide paper is not the least bit affected by this stray light. The finished head was made a tight fit in the lamphouse tube, in order to make the electric light source quickly accessible.



Close-up, showing film carrier and slides

2. Film Carrier

This is also an aluminium casting, weight being removed by coring. The outside diameter was turned to a smooth sliding fit to suit the lamphouse tube. The underside has a cut-out to clear the frame of the negative, and on each side is a row of tapped holes, with which are secured the slides for the strip negatives. The $\frac{1}{8}$-in. Whitworth tapped hole is for the peg which engages in the thread of the focusing ring.

3. Focusing Ring

Again an aluminium casting is necessary and the whole job machined all over. The groove near the edge of the bore is for locating it on the lamphouse tube, and the thread running into the $\frac{3}{16}$-in. drilled hole screwcut in the usual manner.

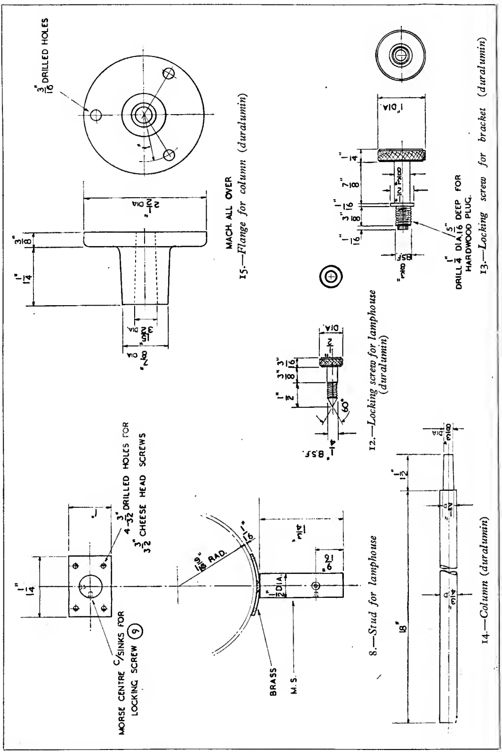
4. Lamphouse Tube

This is a piece of 16-gauge seamless drawn brass tube, as sold for smoke boxes on small locomotives. The ends were squared in the lathe and two pieces cut out at one end to clear the film strip, one of these pieces being used for the lamphouse stud. Midway along the tube is a 3/32-in. tapped hole for a peg to locate with the focusing ring, and beneath this a slot for the focusing ring peg.

5. Flange for Camera

This is a piece of 16-gauge brass, again with a cut-out to clear the negative frame size. The ends are formed to the required angle in order to locate the camera. The flange is then sweated to the underside of the lamphouse tube with soft solder. A piece of velvet was fastened to

**Continued from page* 68, "*M.E.*," *July* 15, 1948.



15.—*Flange for column (duralumin)*

13.—*Locking screw for bracket (duralumin)*

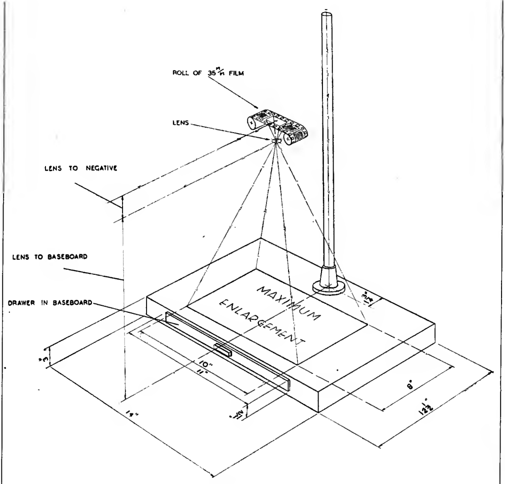
12.—*Locking screw for lamphouse (duralumin)*

8.—*Stud for lamphouse*

14.—*Column (duralumin)*

the underside of the flange with adhesive in order to protect the open camera. To this flange is secured the camera with elastic bands. These are fitted with brass eyes which hook into the four $\frac{3}{16}$-in. drilled holes.

utilised for this part, it being riveted to a length of $\frac{1}{2}$-in. diam. mild-steel. The four 3/32-in. drilled holes in this cut-out portion are used to attach the component to the lamphouse tube while it is being sweated with solder. The two



16.—*Baseplate*

6. Slides for Film Strip

These are made from $\frac{1}{16}$-in. aluminium sheet, and secured to the film carrier with ten 3/32-in. countersunk head screws.

7. The Lamphouse Carrier Bracket

This is an aluminium casting, bored to suit the upright column and the lamphouse stud.

8. Stud for Lamphouse

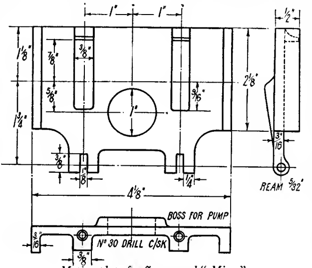
The piece cut out of the lamphouse tube is morse centre countersinks are for locating the head vertically and horizontally. The horizontal position is used when projecting an image, usually colour transparencies on to a vertical board or wall.

Details 9, 10, 11 and 12 are straightforward turning, 13 is the screw for locking the bracket to the vertical column, the hardwood plug in the end of the screw prevents the column being damaged when locking the bracket. The column 14 and the flange 15 need no comment.

Joy Valve-Gear for the "Minx"

by "L.B.S.C."

As with the "Maid of Kent," followers of these notes who are building the "Minx" will see from the reproduced drawing, that the Joy valve-gear is a much easier proposition to make and erect on this engine than the link motion. It also simplifies the pump arrangement, enabling an ordinary eccentric-driven pump to be bolted direct to the motion plate between the two sets of valve-gear, and driven direct by the eccentric that I specified for the crank axle of a Joy-fitted engine. Very little additional instruction is required, the notes given last week being applicable to the gear as fitted to the "Minx" as well as the "Maid," the only difference being in the motion plate, and precious little in that. A separate drawing of it is given here; and you can see that in place of the wide openings for the horizontal guide bars of the "Maid," we need only two $\frac{3}{8}$ in. slots to allow the "Minx's" connecting-rods to pass through it. A boss for the attachment of a pump is provided, and a little lug is cast on above each opening; the underside of this should be filed flat, so that it is exactly $\frac{7}{8}$ in. above the centre line of motion. A No. 30 hole is drilled and countersunk in the top of each lug, to accommodate the screw holding the end of the guide bar to it. In case any beginners think a $\frac{1}{8}$-in. screw isn't much of a support in a 5-in. gauge engine, I might remind them that it equals a $1\frac{1}{2}$-in. bolt in full size, which would do the job (it did on the Brighton engines, one bolt serving for top and bottom bars) but they can put in a 5/32-in. or 3-B.A. if they desire.

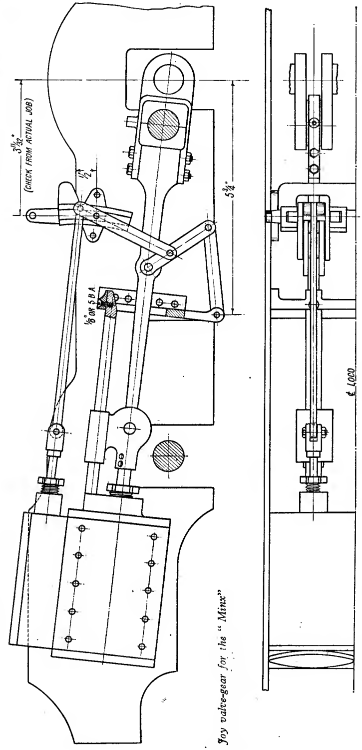


Motion plate for Joy-geared "Minx"

The sides of the motion plate are machined off as described for the "Maid," ditto the lugs at the bottom for attachment of the anchor links. At $\frac{5}{8}$ in. below the centre-line of motion—that is, $1\frac{3}{4}$ in. from top of plate—and on the vertical centre-line, drill a 1 in. hole for the end of the pump barrel; this will go through the centre of the boss. The pump will be a simple affair with a square flange attached to the motion plate by four screws; and for those builders who wish to fit the pump, it would make the erection job easier if they left the final erecting of the gear until I describe the pump (next week, if all's well—my head won't stand too much drawing at one "session") then the whole issue can be put up at one fell swoop. I'm open to wager that it will take builders more than a week to make all the bits of the Joy gear and get them assembled ready for erecting!

Anyway, to save going back on the description, I'll give the procedure for erecting the motion plate right away; it is very simple. Merely insert it between the frames, and set it at right-angles to the centre-line of motion, with the anchor-link pinholes at the bottom, exactly $5\frac{3}{4}$ in. from centre of driving axle, as shown in the illustration of the complete outfit. The lugs over the guide bars should just rest on them when the piston-rods are fully extended (try each separately, of course) then the hole for the screw is located, drilled and tapped by the method I have described many times, and the screws put in. The holes in the side flanges are then located, drilled and tapped with the plate in position—a carpenter's cramp right over the frames will stop any tendency to shift—and the screws put in those too. Then go right ahead and make your slide shaft, die blocks, radius rod, vibrating links, jack links and anchor links exactly as described for the "Maid," and to the same measurements, the only alteration being that as the reversing arm should stand vertical when the gear is in mid-position, the angle at which it is attached to the curved guide, is slightly different from that of the "Maid," owing to the whole gear being much more inclined. The illustration shows how it is set. The approximate position of the slide-shaft trunnions, is $\frac{1}{2}$ in. below top of frame, and 3 11/32-in. ahead of the driving axle centre; check from the actual job, same as the "Maid," and adjust brackets if necessary, before drilling and tapping the screw holes in them.

When you can "waggle" the reverse arm back and forth, without any movement of the valve spindle, with the crank on either dead centre, the gear is O.K.

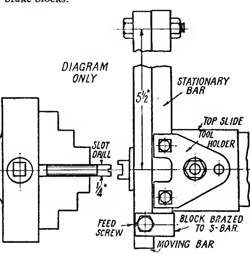


Joy valve-gear for the "Minx"

A Wheeze for Milling Curved Slots

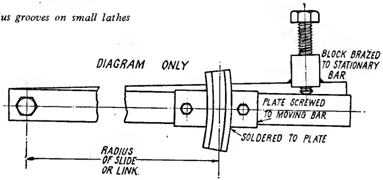
I promised to tell you how the curved slides could be machined on quite a small lathe, in cases where a piece of ready-machined curved bar could not be procured for the slides. Naturally, anybody who owns a lathe with a big faceplate, enabling a $5\frac{1}{2}$ in. radius groove to be cleaned out with a parting tool, will cut the groove in the way I have described for curved slides on smaller engines of $2\frac{1}{2}$-in. and $3\frac{1}{2}$-in. gauge. Another way, for those who have a drill spindle for their lathe, or a grinding attachment to bolt on the slide-rest, is to bend a bit of $\frac{1}{2}$-in. square bar to correct radius (steel is readily bent if you make it red-hot and hold one end in the vice) and clamp it to the faceplate with the centre-line $5\frac{1}{2}$ in. from the lathe centre. The drill spindle or grinder is then mounted on the slide-rest, also $5\frac{1}{2}$ in. centre-to-centre, and a $\frac{1}{4}$ in. slot drill put in the chuck or collet. This is fed up to the piece of curved bar by means of the top slide, applying plenty of cutting oil, if the bar is steel or phosphor-bronze. Gun-metal can be machined dry. As soon as the cutter has penetrated about $\frac{1}{16}$ in. or so, pull the lathe belt very slowly indeed by hand, the belt being on the biggest step of the cone, and the back gear in. This will move the piece of bar past the revolving cutter; and if the latter is sharp, and properly backed off, the result will be a beautifully clean curved slot, which can be cut to full depth by the "ditto-repeato" process. The job can also be done by soldering four separate blocks of metal to a piece of brass plate, clamping same to faceplate at the proper distance from centre, and cutting the grooves at one swoop, either by an ordinary parting tool, or by the

method described immediately above, taking an extra cut over the outsides, to bring the blocks to correct thickness and curvature for attaching to the yoke at the back. The process is pretty much the same as I described for machining brake blocks.



How to mill wide-radius grooves on small lathes

whole link was soldered to a bit of scrap brass plate about ⅛ in. thick, and this was attached to the moving bar by a couple of screws, the distance from the centre of the pivot bolt to the centre of the piece of metal, being equal to the radius of the link. The stationary bar was then clamped under the slide-rest tool-holder at right angles to the bed, and level with lathe centres, and the whole issue adjusted by means of the cross slide, until the slotting cutter in the three-jaw was level with the middle of the blank. The lathe was then started, the slot drill given a dose of cutting oil, and fed into cut by turning the top-slide handle, meanwhile I held the moving bar tightly against the screw on the stationary bar with my left hand. As soon as the slot drill had taken a "bite," I let go the top-slide handle, and still holding the bars together with my left hand, I slowly turned the screw with a spanner, which pushed down the moving bar, and with it the blank, allowing the slot-drill to form a groove of the required length. The process was repeated until I had cut completely through the piece of steel, into the brass backing. The whole doings was then released from the bar by taking out the screws, and heated until the solder melted, and the slotted piece of steel dropped off. The ends of the slot, which were naturally rounded, were squared up



Jig for milling slide-shaft sectors

However, to get back to the "small lathe" wangle, I used this in the days before I had a milling machine, and it worked very well. What you need to get true slots, is some means of guiding the blanks, or the piece of bar, past a revolving slot drill at the correct radius; and the simplest way I could figure out was to pivot a couple of pieces of stout bar on a bolt, as shown in the accompanying sketch.

The little one I made when I had only the small first-floor-back room at my old Norbury home for a workshop, consisted of two pieces of ½-in. square steel bar about 6 in. long, with a ¼-in. bolt through one end. A small block of the same section was brazed to the end of one of the bars, and drilled and tapped for a long ¼-in. bolt. The arrangement is shown in the diagram. I never used it for Joy slides, as the 9-in. faceplate on my Milnes type "R" lathe was big enough to allow for machining the grooves direct with a parting tool; but for Walschaerts, Stephenson or other links with a curved slot closed at the ends, it was the berries. A piece of steel big enough to make the

with a watchmaker's file, and the shape of the link filed around the slot, like building a barrel around a bunghole. Incidentally, in my far-off happy schooldays, at the close of an afternoon lesson on "definitions," our teacher—who, as I have mentioned before, was a human being, and not just an animated text book—laughingly asked the class if anybody could give a definition of "nothing." The two replies that "brought down the house" in a manner of speaking, were, a footless stocking without a leg, and a bunghole with no barrel around it. Returning to the job, the four curved guides for the "Maid" or "Minx" could be machined on a small lathe by a rig-up of the same kind, but it would need pieces of stouter bar, and a longer screw. In place of holding the ends of the moving and stationary bars together by hand, a spring could be used, or the screw arranged with a nut, like a slide-rest screw and nut, but personally I wouldn't bother, just for the sake of four slides. I've still got enough "grip" to hold the bars, though nearing "journey's end"; and readers

who are much younger should have no trouble at all. You only have to prevent the moving bar running ahead of the screw, which might mean a broken slot drill. So much for that; all we need now, is a valve-gear for those followers of these notes who are building the "Maid" with outside cylinders, and that will be similar to "Iris's," but with locomotive-type links, connected at the ends, instead of launch-type links as used on the engine mentioned, and on full-size Great Western engines.

A Few Odd Items

Now to deal with a few points of general interest that have been raised in recent correspondence. Several readers have built "Juliet" with a water-tube boiler, and have reminded me that the promised specification of a suitable oil burner for it, has not yet appeared. Only too true! The culprit, however, is not your humble servant, but our common enemy, Father Time. It is no intention of mine to offer untried "designs" to followers of these notes, leaving them to find out the snags, pitfalls, and what-have-you, and blaming them if the job failed to come up to expectations. I had in mind a simply-made yet powerful oil burner for "Juliet," and have been awaiting an opportunity to make one and try it out, but absolutely have not been able to squeeze in the time to do it. As I've said before, the writing and drawing for two series of articles every week, which includes "serial stories" for building four locomotives, plus a huge correspondence, and the bit of experimental work needed to guarantee results, is in itself a full-time job for a much younger person. I haven't done a total of a full day's work to my own Brighton engine "Grosvenor" since last Christmas; and the parts are all ready for converting the old Brighton signal to automatic working, yet I just cannot find the time to fit them. But I still live in hopes!

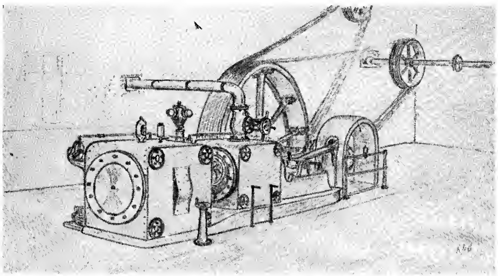
Builders of oil-fired "Juliets," however, need not await my belated experiment to get their engines on the road. There are a few good types of commercial oil burners on the market, "Primus," "Monitor," "Buflam" and so on; and the smallest size available, of the "roarer" type, can be easily adapted to suit the job. The diameter of a No. 1 Primus "roarer" over the flame ring, is less than 2¼ in., which will easily fit "Juliet's" 2⅜ in. width of firebox. One of these burners set on the slant at the back end of the firebox, so that the flame blows on the barrel and tubes just before they enter the circular part of the casing, will keep the safety-valve busy. A stout brass rectangular tank under the trailing end will hold sufficient paraffin for a good run, air pressure being supplied either by a self-contained air pump projecting up through the footplate (I have described these several times, but will give a drawing of the whole outfit when I can manage to make the burner), or a commercial pump as fitted to the stoves. A tube could also be made to project up through the footplate, with a screwed cap on the end, into which could be fixed a tyre valve, and air pressure supplied with a cycle pump. Anybody who has successfully brazed up the boiler, should have no difficulty in silver-soldering up the oil tank, which with burner attached, should be completely removable by undoing a couple of clips or screws.

Speaking of precious time, I do sincerely wish that new readers wouldn't send lists of needless time-wasting queries which they could answer themselves by a few minutes' thought. Because an aero-mechanic building his first locomotive, is used to working to one ten-thousandth of an inch, he apparently expects to find screwholes in a frame, holding non-working parts, dimensioned to the same degree of accuracy. Also, if I dimension a hole in a 3 in. frameplate, as 1 in. from the top, it stands to reason that it will be 2 in. from the bottom, without any figuring; yet a raw recruit points this out as a missing vital dimension, and condemns the drawing as "very vague"! I'm not ridiculing them, everybody is entitled to their own opinion, but do, please, before sending in any query, have a good think and see if you haven't missed something which may have solved your problem in a few minutes, and so save both of us time and trouble.

Another point raised every so-often is allowance for axlebox movement. One reader recently wrote that he had built a 2½-in. gauge engine in which I specified single-flange axleboxes, and now, in 3½-in. and 5-in. gauge, I specify double flanges; why? All full-sized axleboxes are double flanged, and I use them where practicable, but on certain 2½-in. gauge engines, the inner flange was left out to give more room between the inner faces of the hornblocks. This is necessary when there are five eccentrics between, or a couple of cranks, and it is preferable to leave out the inner flange rather than reduce the width of the hornblock; I've found that out by virtue of actual experience—the only way to acquire true and reliable knowledge. On the larger engines, there is a little more room to play in, so the double flanges are used. On a full-sized engine, tilt is allowed for by reducing the thickness of the flanges at top and bottom, though some engines now have trunnion-suspended axleboxes, in which there is a slipper at each side, grooved an exact fit in the horns, and the axlebox itself can tilt between the slippers. If the axleboxes of a little engine are given a weeny bit of side-to-side movement, and the axles are free in the boxes without being "sloppy," the engine will negotiate the average back-garden or club track without any trouble through axles or boxes binding.

Two or three beginners building "Lassies" have reached the stage of getting the valve-gear erected, and find that when the lever is full forward or backward, the die blocks do not come anywhere near the ends of the expansion links. One in particular said that the whole layout was ridiculed by the usual "wise man" of the club, and wants to know the why and wherefore. Well, it is just this. I guess everybody recognises the late Sir H. N. Gresley's ability as a locomotive engineer, and when he gave an opinion, it was worth consideration. He said that a three-cylinder engine need not have a later cut-off than 60 per cent. of the stroke, and when I got out the valve-gear drawings for the "Lassie," using the Thompson valve-gear, I arranged the lever so that the full-gear cut-off was just that and no more. But realising that other folk have different fancies, and many would prefer to use the

(*Continued on page* 90)



A Corliss tandem-compound engine. Jet condenser below floor (note injection cock in foreground next to the L.P. cylinder)

Yorkshire Mill Engines

by A. D. Broadhead

IN the writer's opinion, there is no finer sight than a large horizontal Corliss steam engine. The sketch depicts an engine of the tandem-compound condensing type and is typical of many fine installations to be found in the Yorkshire woollen mills.

The first steam engines to replace the water-wheels formerly used were beam-engines. In some cases, the water-wheels were retained and ran coupled with the engines. A number of these early beam engines still remain, and the writer has seen working, engines which were built ninety years ago. The beam engine gave way, gradually, to horizontal slide-valve engines and they, in turn to Corliss engines. Some mills have drop-valve engines, steam turbines and, occasionally, oil engines; but by far the majority are still running Corliss engines.

The Corliss compound is a classic, because it has stood the test of time. There are Corliss engines running at the present time bearing on their nameplates dates which vary from 1895 to 1923.

The coming of more modern systems has caused change in some cases. Some mills have adopted electric-drive, but many of these, rather than buy electricity or instal a turbo-generator, have simply provided the existing engine with an alternator. Several, however, have increased their transmission efficiency, while retaining the mechanical drive, by the use of ball-and-roller bearings and vee-belt drives. The majority, however, remain much the same as they have been for twenty or thirty years.

The popularity of the Corliss type of engine for mills, springs from a number of factors. First, it is economical. Running on saturated steam at only 100 to 120 lb. per sq. in. a consumption of only 14 lb. of steam per I.H.P. hour is possible for an 800 to 1,200 h.p. engine. Even more important in the driving of textile machinery is steadiness of operation, i.e. good cyclic regularity and close governing. Furthermore, the Corliss-gear gives the engine flexibility, a necessity where wide load fluctuations are encountered.

Steam supply comes from one or more Lancashire boilers. One boiler may be sufficient if no process steam is required, but in many cases a battery of two, three or four is found. The old system of taking live steam from the boilers through a reducing-valve to the process main is in common use, although pass-out working of reciprocating compound engines is met with very occasionally.

Some of the engines run on superheated steam, but saturated steam is more common. The engine stop-valve is frequently of the automatic closing type as manufactured by Tate's. As the valve is opened a large spring is wound up. A trigger holds the spindle in the open position, and the handwheel is detached from the spindle by a catch. In an emergency, the pressing of buttons located at various points in the mill and in the engine house itself, completes an electric circuit

which releases the trigger. The spring then rapidly spins the valve-spindle, snapping the valve shut and stopping the engine. Normally, of course, the valve is closed by re-catching the wheel and unwinding the spring. The reason for providing the detaching gear for the valve-wheel is that if the wheel were solid to spindle, inertia would jam the valve tight if it was tripped.

In the event of a runaway, due to failure of the normal governor, a small overspeed governor will stop the engine by tripping the above-mentioned stop-valve.

The most usual governor is the Porter. Where very fine regulation is aimed at this will operate through a relay. The governor controls the point of cut-off in the high-pressure cylinder and sometimes in the low-pressure as well. Where the governor is not linked up with the L.P. it is customary to provide a hand-wheel for adjusting L.P. cut-off so as to maintain a suitable receiver pressure and therefore an even distribution of work between H.P. and L.P.

Tandem-compounds and cross-compounds are both to be found in plenty, while very occasionally a double tandem-compound is to be seen.

Overhung unbalanced cranks are the rule and in a two-crank engine the flywheel is mounted between the two beds.

Most engines run "over" and, hence, the cross-head slides require little or no bearing surface on top. As a result of this, and also to permit horizontal withdrawal of piston-rod cotter, the cross-head slides are well below centre-line, having an ample bearing surface under the slippers and just a light keep-plate over feet projecting from the slippers, on top.

Nearly all condensers are of the jet type. Jet condenser combined with horizontal double-acting air pump is often mounted in tandem behind the L.P. cylinder. In some of the earlier engines, the exhaust was condensed by a jet of water passing straight into the exhaust pipe, a vertical single-acting extraction pump being mounted under the engine and driven from the cross-head by links and bell-crank. One maker fitted an Edward's pump driven by bell-crank and links from a tail-rod on the L.P. cylinder.

Flywheels are multi-grooved for rope drive and are built up in segments bolted together. Two rows of spokes are used in wide wheels. Radial boards are frequently found on these wheels, filling the gap between shaft and rim and turning it, in effect, into a disc wheel. This reduces windage as well as improving appearance. Some high-class installations have flywheel and rope-race completely walled in and, therefore, external to the engine-house proper. The barring engine operates *via* a pinion which engages teeth on the flywheel rim.

Corliss valves make for excellent cylinder drainage, and any condensate formed on starting is taken care of by drains from the exhaust chambers. Naturally, spring loaded reliefs are provided. Reducing-gear for use in indicating is often either permanently set up or else arranged to be easily brought into use.

The mill-engine building industry of Yorkshire went out of existence in between the wars, on account of the textile slump. Later when trade improved new installations were supplied with other forms of power. However, thousands of those wonderful old engines happily are still with us—some of them carrying loads they were never intended to carry. They remain an undying tribute to their designers.

Large horizontal steam engines of various types are still built in certain parts of this country for special purposes, mostly for export abroad. They are built on lines which are now more or less characteristic of engineering production, machining being carried out only where essential. What a contrast they form to these engines in the woollen mills! Here, finish is paramount. Governor columns are turned all over. Cranks and connecting-rods are all highly finished. The appearance suggests perfection, and the efficiency and performance are in keeping with the appearance.

"L.B.S.C."

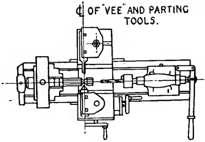
(Continued from page 88)

Thompson full-gear cut-off of 75 per cent., that was arranged for; and if you fancy a longer full-gear cut-off, all you have to do, is to pin the reach rod higher up the lever, and so give the reversing arms more movement. No alteration is necessary to the valve-gear. But you'll find that when you get the engine running on a continuous line, you'll need those die blocks as near to the middle of the links as you can get them, without making the engine "kick" or "pound," otherwise she will do her best to run away with you.

A North Country reader sounds a solemn warning against departing from the "words and music" and composing a tune of your own. He is also building a "Lassie," and having completed the "works," he set about the boiler. Now he knows a friend who is a coppersmith by trade, and that worthy told him that there wasn't the slightest need to flange the copper plates if they were to be brazed at the joints. Our N.C friend therefore went ahead and made his boiler without any flanged joints, butting the front and back of the firebox against the sides and crown, and butting the combustion chamber tubeplate against the end of the chamber. All seemed to go as merrily as a marriage bell, and the boiler was finally completed. Water was pumped in to test as per notes, when, whoosh! at 50 lb. there was a sudden rush of water from the firebox. Examination showed that the joint between the combustion chamber and the tubeplate had completely failed, and the boiler was useless. My diagnosis is that the joint cracked when the final brazing operation was in progress. Anyway, our friend metaphorically dons sackcloth and ashes, says never again will he depart from the results of experience, and is now building a new boiler with flanged joints.

A "Quick-Change" Tailstock Chuck

by "Norman"



Set-up for union-nuts (not to scale)

IT all started when I decided to make a couple of dozen union-nuts !

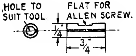
I have always been an ardent follower of "L.B.S.C." and still am for that matter—you don't change a winning side !—and when building my third locomotive to his specifications, I decided to mass-produce wherever possible to save time, in order that the commencement of my fourth locomotive wouldn't be too far distant.

Now all "Live Steam" followers know the routine for union-nuts: "Chuck a length of $\frac{5}{16}$-in. hexagon brass, centre, drill $\frac{1}{8}$ in. for about $\frac{9}{16}$ in. then 7/32 in. for $\frac{5}{16}$ in. depth, flat bottom with 7/32-in. D-bit, tap $\frac{1}{4}$ in. × 40, chamfer and part off." One reads the instructions easily and quickly, and filled with visions of a couple of hours' work producing a box full of union-nuts, I ventured forth to my workshop.

The $\frac{5}{16}$-in. hexagon brass was chucked, then followed *my* routine : "Place centre drill in tailstock chuck, tighten chuck, centre, loosen chuck, replace centre drill with $\frac{1}{8}$-in. drill, tighten chuck, drill, loosen chuck, replace $\frac{1}{8}$-in. drill with 7/32-in. drill, tighten chuck, drill, loosen chuck . . . . drop chuck key, find chuck key, etc." two hours later, eleven union-nuts reposed forlornly in the box, and when I went to bed that night there were drill chuck keys dancing on the bedposts ! My attempts at mass-production left much to be desired.

Obviously, what was needed was a capstan slide or a revolving tailstock turret. After due consideration, it was considered that the former would take up too much valuable locomotive time, and the latter would cause too much skin to be knocked off my knuckles by the drill and tap ends sticking up in the air—I should perhaps mention that I am blessed with more than my fair share of thumbs ! Eventually, the "quick-change" chuck, about to be described, was evolved. A couple of evenings were taken "off" locomotive work to make it, and a goodly assortment of bushes has since quickly accumulated. The time spent in making the chuck has been repaid many times by the overall saving in time in building just one locomotive.

The "chuck" consists of a tailstock adaptor (A), a set of sleeves (B), and bushes (C). The sizes given are for my lathe, but they can easily be modified to suit other types. Incidentally, I use a drawbar to keep the adaptor tight in the tailstock spindle, to prevent damage to the taper bore through the adaptor turning. I have made, to date, six sleeves. One sleeve is required for each operation and few jobs require more than six tailstock operations. The bushes are made as required and amount to one for each size of drill, tap, reamer or D-bit used.



Part (C)—brass

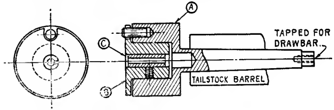
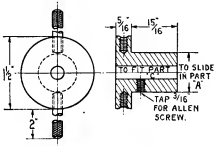


Fig. 1. General arrangement

A word about material and machining. I used mild-steel for the adaptor and sleeves, silver-steel for the driving pin, and brass for the bushes. The material was obtained from a large reputable scrap dealer in the town. When I hear model engineers complaining about the difficulty in obtaining material, I sometimes feel that this source of supply is not exploited to the full. The material I obtained was free-cutting mild-steel and was delightful to work. Enough "cut-offs" in this and other steels, including tool-steel, can be obtained from the scrap yard to keep the average home workshop stocked in "jobbing" material for several years, at the cost of a few shillings. A $\frac{3}{16}$-in. × $\frac{1}{4}$-in. Allen type grub-screw is used to "pinch" each bush and tool in the sleeve but care must be taken to ensure that the screw does not project above the outside diameter of the sleeve when tightened up. For tools larger than a $\frac{1}{4}$ in. diameter the bush can be dispensed with, and a sleeve made with correct bore, the Allen screw bearing directly on a flat on the tool

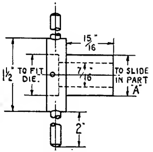
shank. After the taper has been turned on the adaptor, it should be inserted into the lathe mandrel for boring and facing. The correct size of hole in the sleeves can be obtained by first drilling with a drill a few thous. smaller than the final size, then opening out with the correct size of drill. The final drill thus acts more as a reamer, and a good fit will result. The sleeves must be a nice sliding fit in the adaptor and likewise the bushes, before slitting, a nice sliding fit in the sleeve.



Tap holder—mild-steel

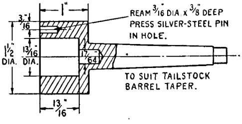
A later development was the addition of a tap holder and die holder, each fitting the adaptor bore. A sketch of these items is given. It should be noted, however, that no slot is cut in either of these items for engagement with the driving-pin on the adaptor.

To return to the union-nuts. My method for mass producing these is now as follows :—The adaptor and drawbar are fitted to the tailstock. The centre drill is fitted to its sleeve (I keep a special sleeve, without bush, for the centre drill, as it is used on so many jobs) a ⅛-in. drill is fitted with bush to a second sleeve, the point of the drill projecting say, 2 in. from the face of the



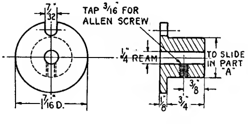
Die-holder

sleeve. The 7/32-in. drill is fitted to the third sleeve, the point of this drill projecting 1¾ in. from the sleeve face (¼ in. less than the ⅛-in. drill). The D-bit is fitted to the fourth sleeve, its cutting edge projecting the same amount as the point of the 7/32-in. drill. The ¼ in. × 40 tap is fitted to the tap holder. I only use a plug tap and dispense with taper and second taps on a brass job of this kind. The hexagon rod is then chucked in the three-jaw. No. 1 sleeve is inserted into the adaptor and the rod centred. This sleeve is then removed and No. 2 slid in, drilling to a depth of 9/16 in. A pencil mark is made on the tailstock barrel when this depth is reached. No. 2 sleeve is then replaced by No. 3 and this drill fed in to the pencil mark, followed by No. 4 sleeve, with D-bit, to the same mark. Finally, the tap holder is put in, and the hole tapped until the tap bottoms. For this operation, of course, the tap holder is turned in the adaptor by means of its cross handle, whilst the lathe mandrel is stationary. The nut is then chamfered and parted off, using



Part (A)—mild-steel

a "Vee" chamfering tool in the toolpost and a parting tool, upside down, in the back tool box. These are set so that the centre-line of the Vee is the same as the centre-line of the parting tool. Thus the saddle is not moved at all after its initial setting. I should have mentioned that, before commencing drilling, the projection of the hexagon rod from the three-jaw chuck face, is measured with a 4-in. rule. The three-jaw chuck is then loosened and the hexagon rod pulled out again to this same measurement. The drilling operations are then repeated to the same tailstock mark as before. By fitting a plain piece of rod to an extra sleeve for use as a stop for the hexagon



Part (B)—mild-steel

rod, even the measuring operation from the chuck face could be eliminated. However, I find that this only takes three or four seconds. On my first usage of the above method I produced fifty-eight union-nuts in one hour, the total "setting up" time accounting for an extra six minutes—from "scratch." I felt like the village blacksmith ! Since then the quick-change chuck has been used for numerous jobs—drilling and reaming wheels, making union nipples, valve

(*Continued on page* 96)

A Boring-Head for the Lathe

by Arnold Thorpe, M.I.Mech.F.

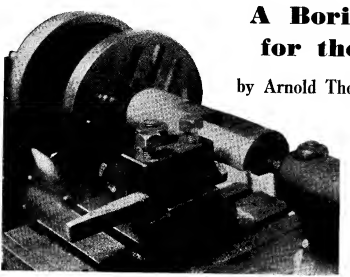


Photo No. 1. Turning the slide portion (second operation)

THE lathe is the model engineer's principal machine-tool, and often he must use it for operations which in factories would be done with greater convenience on special machines. The limitations of the small lathe are easily apparent to those who have been accustomed to the facilities available in large works, and much ingenuity must, at times, be applied in order to accomplish awkward jobs.

Simple turning usually presents no difficulty with sound machines, since the diameter of work which can be swung over the saddle exceeds the centre height. This will usually deal with the largest shafts and pistons likely to be needed. The machining of surfaces of castings such as crankcases, large cylinders, frames, brackets, and connecting-rods, is not so easy. Such parts involve boring holes of large size, much too big for drilling; turning registering spigots; facing flat areas; undercutting of holes, and so on. There are three main ways of dealing with these jobs, each of which has good points as well as disadvantages.

The methods are as follows :—

(*a*) Grip work in chuck or bolt to faceplate, and rotate work, using tool held on saddle.

(*b*) Bolt work on saddle and fix cutting tool in boring-bar running between centres, the work not rotating.

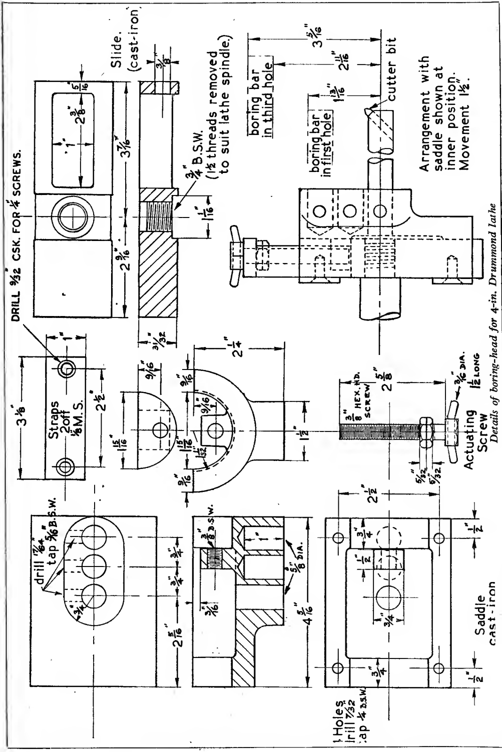
(*c*) Bolt work on saddle with cutting tool carried by overhung boring-bar rotating with lathe spindle.

To all these there are variations of no significance such as the use of angleplates, machine-vices, etc., but the fundamental principles of the three methods remain.

Considering method (a) it is true that all the motions of the tool which the saddle can provide are available, but the limiting size of work-piece which can be swung over the bed is soon reached, especially if one hole needs boring a long way from some other part, as occurs in connecting-rods, links, levers, and cylinder blocks of multi-cylinder engines.

Often the surface to be tooled must be at some particular and precise relationship to another surface; for example, parallel with it, or at 90 deg. to it. If a definite measurement is also required, the setting-up of the work may call for a lot of skill and patience. Some jobs, whilst within the swinging capacity of the lathe, cover so much of the area of the faceplate that there is no hole or slot to receive a bolt, or no surface to take the packing for a clamp. Excessive overhang may exist, giving rise to chatter and the possibility of the job moving out of place whilst cutting.

Method (*b*) is, of course, quite well known as a method of boring engine cylinders, and the support of the boring-bar at both ends is an excellent feature. It can only be applied to cylinders open at both ends, and the diameter of the bar is restricted to that which will pass through the smaller end. For large bores the cutter has to stand out of the bar a long way and is then weak. Flat surfaces such as the ends of cylinders can only be tooled by a broad cutter, ground and set exactly square with the axis of the bar. The broad cut involves the risk of shifting the job, and probable chatter, which on a valve face or a cylinder-end might give rise to serious leakage. If, through wear of the spindle front bearing, or the tailstock being slightly set over, the boring-bar is not quite parallel to the slideways of the bed, these end faces will be out of square with the bore of the cylinder. This will probably bring the crankshaft out of square with the cylinder, and may seriously affect the endurance of a high duty model, as I have known it affect full scale mill engines. It is often desirable to bore the central part of a hole a little larger than the ends to ensure the bearing being near the ends to prevent rocking. It may be a feature of a piston-valve engine that annular grooves are to be made around the ported part of a liner. The boring-bar between centres does not lend itself to this kind of work at all, since the tool cannot be fed outwards while it is rotating. Also, the setting of a tool to cut some particular size is never easy, and in large works it is common to provide expensive constructions of bars and expensive setting instruments when bars of this type have to be used.



Details of boring-head for 4-in. Drummond lathe

Large Scale Practice

In many engineering works there are machines in use for these jobs which carry an overhung boring-bar, with mechanism for feeding the bar outwards whilst in motion. One of the best, made by Messrs. Geo. Richards of Broadheath, near Manchester, has features very similar in principle to the lathe. There is the rotating spindle, a compound boring table sliding along the bed, and a form of tailstock for supporting the "through" type of bar. The spindle is fitted with a slide at 90 deg. to its axis, and a small saddle on this slide carries an overhung or "snout" boring-bar, to the end of which the cutter is attached, without any other support. The cutter can be traversed radially whilst rotating and thus generate a flat surface. Similar advance whilst cutting inside a hole results in an undercut or groove.

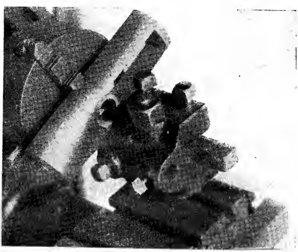


Photo No. 2. Boring slide portion to suit lathe mandrel

These machines are astoundingly versatile, as they can do an amount of external turning on a stationary casting by setting the tool inwards at the end of the bar. The boring table moves along the bed with screwcutting gear, across the bed, and usually can be rotated or "indexed" to face up parallel and 90 deg. surfaces. The spindle housing travels up and down a vertical slide also, but if one leaves out this feature and the rotation of the boring table it will be seen that the only fundamental difference from the model-maker's lathe is this ability to move the boring-bar in and out whilst rotating.

During the last ten years or so miniature boring-heads having a resemblance to the slide of the Richards' machine have become popular for use on milling machines in engineering shops to enable odd jobs to be done, but these heads do not have means for advancing the tool whilst running.

A Decision

Having wrestled with outsize jobs on my 4 in. Drummond on several occasions, I decided some years ago before the war, to make a boring-head to overcome these troubles. At that period I had no access to large machine tools and the design of the head was fitted to the possibility of making it on the Drummond itself. Others similarly placed may like to see how it was done, and I am, therefore, describing it in that way. I am well aware that certain refinements could be included, such as a fine thread actuating screw in place of the $\frac{3}{8}$-in. Whitworth, and a micrometer collar as well as a star wheel would add to its usefulness These had been projected but pressure of business and later the war itself prevented their realisation. During the war this head was used on many occasions in the factory with which I had by that time become concerned, boring holes on milling machines in castings too big for the largest lathe, and proved so valuable that a replica was made for permanent use.

General Design

The head is shown in the drawing, from which the semi-circular shape of the slide-way will be seen. I chose this profile because it seemed the only one which could readily be produced on the lathe. Vee-slides need shapers or millers and yet the semi-circular form is not a long way removed from the vee and is equally able to give straight-line motion and firm control of the sliding element, free from slackness in the slide.

Constructional Methods

I made patterns in soft wood, exactly like the castings needed to be, with allowance for the machining of appropriate faces, and got iron castings from a local foundry. After scrubbing with a wire brush to remove as much grit and sand as possible to avoid tool wear, the slide was tackled first, centres being marked at each end and drilled with a hand drill. From the photographs it will be seen that a little boss was left at each end for the centres on which to do the turning. The part was turned for about half its length to the finished size, taking quite a lot of cuts and by degrees adjusting the setting of the tailstock to get perfectly parallel work. A very stiff tool was used as will be seen in Photo No. 1, and there was no trouble from chatter or any other cause, though the cut extended only round about 55 per cent. of the circumference. It was, of course, necessary to employ the Walram pattern back-gear with which the machine is fitted.

After turning parallel about half the length the "waist" of slightly smaller diameter was put in, no definite size being maintained, as this is only clearance. The piece was then turned end for end and the second half turned down to exactly the same size as the first, relying on touch with calipers, as nothing better was available, or needed. To any who may produce one of these slides I would say the exact size is not important at all, as the other piece to slide on it will be made

to suit, and no problems of interchangeability which beset the commercial producer will arise. The important thing is that the slide should be parallel. During this second part of the turning the piece was driven by a bolt in the faceplate as shown in Photo No. 1. It was not possible to finish this job at a single setting, as there was not enough saddle movement available. By casting-on a boss or chucking-piece, I daresay this could be done, but the method described worked out very well in my case. Both ends of the piece were faced true whilst this set-up was made and the projecting pips of the centres were filed away later when they had served their purpose.

The next operation involved boring and screwing the hole to fit the lathe spindle, which is $\frac{7}{8}$-in. Whitworth. The casting was mounted in the four-jaw chuck as shown in Photo No. 2 and adjusted with extreme care so that when rotated a tool just touched the cylindrical surface at both ends with the same pressure. A dial indicator would have been more convenient but none was available at the time. The care taken in this setting determines whether the flat surface later to be machined at the back of this casting will come parallel with the cylindrical part by machining only. If it fails, there will be more hand scraping to do to get it right, so it is well worth care in setting.

A series of drills was put through, enlarging the hole by stages, until a boring tool could be used and the hole bored to tapping size. A flat face was then produced and the hole bored to a shade over $\frac{7}{8}$ in. diameter for about 5/32 in. in from the face, which was made $1\frac{1}{16}$ in. diameter to clear the shoulder of the spindle. Gears having been set up for screwcutting, the thread was cut. When nearing final depth, the chuck was screwed off the spindle, still holding the work, and the spindle itself used as a gauge to determine how much still remained to come out. A succession of light cuts eventually produced a thread fitting closely on the spindle.

The casting was then removed from the chuck and screwed on the spindle with the yet unmachined face towards the tailstock. This side was then faced with the cross-slide set square to the bed. It will be recalled that the slide on the Drummond 4 in. swivels about, and there is no positive means provided to set it exactly right for facing on long cuts. A very nearly correct setting was made by bringing it hard up against the faceplate, put on temporarily for that purpose. During the facing operation the thickness of the work was carefully calipered after successive cuts, and a little fine adjustment of the slide made from this. The final result proved entirely satisfactory.

The drilling of the hole for the actuating screw was a simple job, but as a precaution the casting was bolted down on the boring table. Using the tailstock might have permitted the hole to run by reason of the drill and work buckling away from one another, but there was no risk of this with the casting firmly held.

Machining the saddle-piece was rather an involved business, as it was not possible to bore right through it at one setting, since the lug which forms the nut for the actuating screw gets in the way of the boring-bar. It had been debated in the design stage whether to fix in a detachable-piece for the nut, but it was decided that the complications of doing this were as formidable as machining the cast-solid job, and there would be a bit of fun in doing it anyway. It was, therefore, necessary to bore one end of the saddle first and provide means for accurately re-setting it when turned round to do the other end. It will be noticed from the drawings that the saddle is relieved in the middle and fits only on a narrow strip at each end.

(To be continued)

A "Quick-Change" Tailstock Chuck

(Continued from page 92)

bodies, check valves, nuts and bolts and safety-valves—to mention only a few—all showing considerable time-saving over the ordinary drill chuck method.

By using a running-down cutter in a sleeve, followed by a die in the die holder, the manufacture of small hexagon-headed bolts in quantity is child's play. I don't think that tyros realise the saving in time, by using a running-down cutter, over the normal turning time with a tool on the small bolt diameters. A high mandrel speed and suds oil are very necessary for a good job. When making bolts, I also use a stepped parting-tool, to leave a pip at the end of the bar of the correct diameter. This pip then enters the running-down cutter and prevents whip when starting the cut. I need hardly add that the parting tool should be as close to the chuck as possible to ensure rigidity.

The slot in the sleeve must engage with the adaptor pin of course, before drilling or reaming, and the sleeve shoulder is held in contact with the adaptor face by straddling the drill and pressing against the face of the sleeve with two fingers of the left hand, whilst working the tailstock lever feed with the right hand. I find that straight-fluted drills are far superior to twist drills for drilling brass jobs. They don't "snatch" or "clog" so easily.

Whilst not suggesting that the above lathe accessory is in any way equal to a capstan slide or tailstock turret, it "does the job" and takes far less time to make. The quick-change chuck seems to prevent the "chuck in three-jaw, chuck in four-jaw, chuck in scrap-box" routine that seems to go hand-in-hand with prolonged repetition machining in the home workshop.

Finally, I claim no originality for any of the above, other than the fact that this is the first article I have written for THE MODEL ENGINEER.

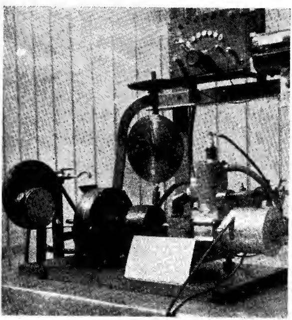
PETROL ENGINE TOPICS

*Testing Small I.C. Engines

by Edgar T. Westbury

IT is often very desirable to apply tests at various loadings of the engine for the purpose of exploring the entire range of speed and power. By this means one can find out many valuable facts applicable to the practical employment of the engine; for instance, what airscrew or water propeller to use in order to utilise the maximum power the engine can develop, the most suitable gear ratio to use in a model racing car, and the behaviour of the engine when accelerating under load from a low speed.

Although it is possible to use fan brakes or airscrews of different sizes and pitch dimensions to measure the power obtained at various loads and speeds, both convenience and accuracy are improved by providing means of varying the load while the engine is running. In cases where an engine must be stopped for altering the load, a good deal of time is lost and there is also a risk that the conditions of running may not be exactly reproduced in a number of consecutive runs.



Mr. Latta's hydraulic dynamometer, showing his 43-c.c. two-stroke engine on test

The Variable-pitch Airscrew

One possible method of adjusting load would be by the use of a variable-pitch airscrew, embodying mechanism similar in general principle to that employed in full-size airscrews of this type, but while I believe this to be practicable, there are certain difficulties in the construction of such devices, and I have not seen it actually employed. A more feasible proposition, which has been extensively employed in the testing of full-size engines, is the enclosed or "escargot" type of fan brake, in which the load is varied by controlling the entry or discharge of air to or from the fan casing. The fan employed may be either of the axial ("propeller") or centrifugal type, the latter being generally favoured, as it facilitates control, and also the fitting of suitable air ducts to enable the discharged air to be utilised for engine cooling. Load control is obtained by shutters or flaps in the inlet or discharge passages, sometimes both. This principle is very effectively employed in the Heenan-Felldynamometer, which is used for testing large air-cooled radial aircraft engines.

Other methods of loading engines, such as water pumps, dynamos, etc., are quite practicable in conjunction with torque reaction measurement, but often they introduce practical difficulties, rendering them somewhat cumbersome in this particular application.

Problems and Complications

Direct-coupling of the loading unit is always highly desirable, to say the least, and although there is theoretically no objection to the use of belt or gear drive between the engine and the load, practical experience suggests that it may introduce problems and complications, and is best avoided. Complete and self-contained "absorption dynamometers" of the type to be described are by far the most satisfactory for all-round tests of engines varying widely in type and size, and are strongly recommended to serious investigators of engine development. It is, however, emphasised that the torque reaction balance is capable of just as high an accuracy as the most elaborate form of dynamometer, and for purposes within its scope, is often to be preferred by the user who is concerned mainly with the tuning and testing of a particular engine or a number of similar or comparable types.

*Continued from page 40, "M.E.," July 8, 1948.

Absorption Dynamometers

Strictly speaking, the term "dynamometer" means nothing more than a device for measuring force, and may be applied to a simple spring balance or beam scale; but in engineering practice, it usually refers to a specialised instrument or machine for power measurement. If the machine incorporates the loading device or "brake" which absorbs the entire power output of the engine, it is known as an "absorption dynamometer." Devices of this nature include all kinds of solid-friction brakes using ropes, bands or brake blocks, fluid-friction (air or water) brakes, and electro-magnetic or eddy-current brakes. I do not propose to deal with these devices in detail, as they have all been fully described at various times in THE MODEL ENGINEER, but some information on their characteristics will be helpful to readers who wish to utilise them for testing engines of the type under consideration.

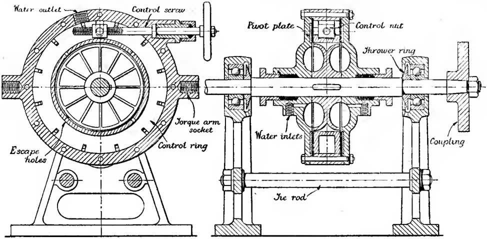


Fig. 3. *A hydraulic dynamometer described by the writer in the issue of the "M.E." dated June 18th,* 1936

Simplest Brakes to Apply

Solid-friction brakes are perhaps the simplest to apply, as the engine flywheel or starting pulley may be utilised as the brake drum, and in rope or band brakes, elaborate means of applying the loading weights are unnecessary. In the case of low- or moderate-speed engines or electric motors, the simplest forms of these brakes may serve their purpose quite efficiently, but on many occasions I have expressed doubts as to their suitability for engines of high speed and high performance. Apart from the fact that the torque characteristics of such brakes are exactly opposite to what is required in such cases, thus rendering load adjustment critical and difficult, they are not well suited to the absorption of considerable power for any length of time.

In view of the fact that the energy absorbed by a brake must necessarily be dissipated in the form of heat, it will be clear, even to readers who have no specialised technical knowledge of this subject, that in a high-performance engine, the heat generated in the brake and brake drum will be considerable. A small engine with a flywheel 2 in. diameter, producing about $\frac{1}{4}$ h.p. (some engines with flywheels of this size develop considerably more than this figure), would burn a rope brake through in a few seconds, and even if heat-resisting materials are used in the brake, this does not solve the problem of dissipating the heat generated which, in the case quoted, is something over 10 Joules per min. It is, of course, possible to make special arrangements for cooling the brake, but the operation necessary destroys the virtue of the device.

I am aware that some readers have claimed to have used these simple brakes quite successfully; it is not for me to contradict them or cast doubt on their claims, but I state only that I cannot get satisfactory results from them myself.

Fluid-friction brakes are more elaborate, and must generally be constructed as a separate unit, to which the engine is coupled for tests, but they simplify the problem of heat dissipation, and, more important still, provide much more flexible and consistent loading, with load characteristics much better suited to the torque of the engine. A well-designed dynamometer of this type will deal with a very wide range of torque, and can be kept in balance almost indefinitely at any load.

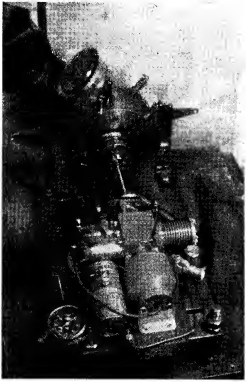
Fluid-friction Dynamometers

The best known form of fluid-friction dynamometer is the hydraulic type; this is extensively used in full-size practice in the form of the Froude brake, which is probably the most compact device known for absorbing and measuring high power. With this type of brake, heat dissipation is very effectively disposed of by a copious and continuous flow of water through the brake casing.

Hydraulic brakes have been applied to the testing of small engines by a number of experi_

menters, including Mr. J. Latta, Mr. A. D. Rankine and Mr. H. Scamell, the latter having used a brake of my design which was described some years ago in THE MODEL ENGINEER (Fig. 3). Mr. Latta's brake now forms a part of the S.M.E.E. testing laboratory equipment, and was one of the features of the Jubilee Exhibition of this Society.

The use of a water or oil pump, which may be defined as a form of hydraulic dynamometer, is



Mr. Rankine's horizontal 15-c.c. "split- single" two-stroke engine on test, using a hydraulic dynamometer

by no means uncommon as a method of engine testing. Load may be controlled by varying the delivery head or throttling the output of the pump. While this method may prove entirely satisfactory in certain cases, however, the torque characteristics of a pump are somewhat indeterminate, and it may be found difficult to obtain close control of load, or cover a wide range of torque. Some types of pumps slip badly when throttled, or when working under increased delivery head; they may even "cavitate," and thus cause violent change of load, which would be fatal to success in this capacity. There is little doubt that a properly designed hydraulic brake would be far more satisfactory for power measurement.

A very important point in the design of a brake of this type is that the control of load must be simple and progressive throughout the range, and should not be subject to variation when once set. Some designers have gone to great pains to design brakes which certainly absorb power effectively, but have no provision for the variation and control of torque; these offer absolutely no practical advantages over the use of a simple fan brake in connection with the torque reaction balance.

Electrical Dynamometers

The general characteristics of an electrical dynamometer are similar to those of the fluid-friction type, but in most cases the energy is converted into electrical power, and may be dispersed through a resistance (in the form of heat), or usefully employed to charge batteries or in any other convenient way. In some respects, electrical methods of absorbing power may not be so adaptable as fluid-friction devices, and for testing very large engines, the size of the dynamometer may be greater than is desirable, but this does not apply in the cases we are considering.

The simplest method of absorbing power electrically is to use an ordinary dynamo of a size large enough to cope with all the power the engine is capable of generating, and with provision for the control of output, such as by shunt or series resistances. This affords positive and delicate control of load, and the wattage output must necessarily bear some definite relation to the h.p. input; therefore, the latter may be read directly by means of a calibrated wattmeter.

Small Scale Difficulties

This method is often used industrially, but there are several difficulties in its use on a small scale, due to the inevitable losses, both mechanical and electrical in small generators, and the fact that these may not remain constant under working conditions. It is, therefore, better to use the electrical output purely as a means of load control, and measure the torque mechanically. This is done in the "swinging field" type of dynamometer, which embodies a generator of more or less standard form, but having the outer frame or field magnet mounted on bearings concentric with the shaft, and equipped with a torque balance, as in other types of absorption brakes. The torque exerted in driving the generator can thus be weighed, and the accuracy is not in any way affected by electrical losses.

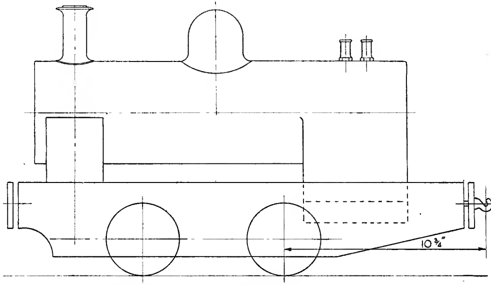
One great advantage of the electrical dynamometer for small power measurements is that great delicacy of control is possible in the lower ranges of torque, especially when means are provided for separate excitation of the generator field from an outside source of power.

It is thus possible to apply "negative load" or in other words, the dynamo can be used to "motor" the engine. The obvious use of this feature is in the function of a self starter, but it is equally valuable as a means of investigating mechanical losses by friction, air pumping, etc., as the torque absorbed when the engine is driven by the dynamo, acting as a motor, can be measured just as readily as power torque.

(To be continued)

A MODEL LOCOMOTIVE PROBLEM

by K. N. Harris



Outline (not strictly to scale) showing overhang at rear end

RECENTLY, I came up against a problem in connection with the design and construction of a model locomotive I am building. The engine is a 3½-in. gauge, 0-4-0 tank, and is *not* a ¾-in. scale job as one would at first sight expect, but a 1¾-in. scale model of a 2-ft. gauge engine of the type used by contractors and large industrial concerns such as gasworks. As with all engines of this type, the overhang is considerable, particularly at the rear end. The drawing gives an outline showing this.

Now, readers familiar with tank-engine practice will know that, in similar cases, the anchorages of the drawbars are taken well away from the buffer-beams towards the fixed wheelbase in order that, when working on curves, the draw-hook keeps approximately over the centre-line of the rails and does not set up a side-pull, tending to derail engine and trucks. A study of the drawing will show that, owing to the location of the firebox, such a procedure was out of the question in my case. As the engine may be required occasionally to work over sharp curves, the problem was how to meet the situation.

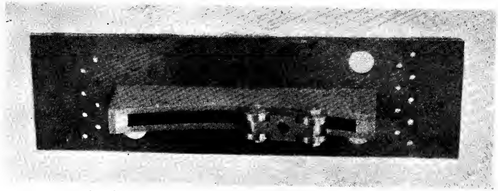
After a certain amount of theorising (just another name for thinking), the solution to be described was hit upon; it gives, in practice, results identical with those which would be obtained from a draw-hook anchored over the centre of the driving axle and allowed to pivot freely in the horizontal plane about its pivot. As with model locos, it is rare to work them on heavy hauling wnen the load is coupled to the front, it was not considered necessary to duplicate the arrangement at that end; the draw-hook was made as long as the location of the smoke-box allowed, and given free side-play.

The scheme is illustrated in the photograph, and consisted in building a drag-beam having a curved track on its forward surface, the curve being part of a circular arc, the centre of which is a point on the longitudinal centre-line of the frame assembly located vertically over the driving-axle.

Tracking on this is a small four-roller trolley to which the draw-hook stem is flexibly anchored. A spring consisting of a series of rubber washers, with thin metal separating washers is interposed between the draw-hook nut and the abutment of the trolley.

It will be seen that, geometrically, the arrangement is identical with that in which the draw-hook shank is extended and anchored above the driving-axle, and being, of course, free to swing horizontally.

The photographs show quite clearly the details of the arrangement, the first showing the complete assembly of drag-beam and buffer-beam, without buffing-plate mounted. As the engine is likely to have to work with a variety of sizes and shapes of rolling-stock, large spring-backed buffing-plates, were decided upon at each end,



Assembly of buffer-beam, curved drag-beam and draw-hook carriage

so as to match up with the buffers of anything likely to be met.

No claims are made for originality (though, so far as I am concerned, it is original), as the geometry of the thing is so obvious and elementary that it is quite likely to have been used before.

It may be said that the scheme involves a lot of work; but the problem is a very real one, and this scheme does give a satisfactory mechanical solution. Actually, the whole issue was made in three evenings.

Probably, others have run up against this problem in the past, and the solution I have used may be of some interest; to those who may run up against it in the future, I hope my method may be of some use.

Buffer beam, and curved track drag-beam with draw-hook carriage shown separately

ELECTRICAL SURPLUS GOODS

Among items, brought to our notice recently by Messrs. Gamages, of Holborn, E.C.1., are a large assortment of war surplus goods, including engine-driven generating plant, motor generators and other electrical equipment, also signalling gear. High-efficiency cluster filament lamps, designed for flash signalling, are offered at low prices. These elements consume 1,500 watts at 80 volts, and are suitable for use in optical lanterns, or epidiascopes, or for photographic studio illumination; for the latter purpose, three lamps may be connected in series to work off 230 to 250 v. mains, and give a good light.

We have also examined a small electric motor which produces high torque at a moderate rate of speed on an input of 1 ampere at 24 volts, and would be well suited for model traction duty or other purposes where quietness with efficiency and durability is required.

Another useful electrical surplus item is a replacement coil for American Bosch aircraft magnetos, which serves as a highly efficient ignition coil when used in conjunction with a 4-volt battery.

Filing-Rest for the Adept Lathe

by S. A. Stead (Australia)

HAVING a need to make up a few hexagonal nuts from round bar, the writer found that reliance on manual dexterity and judgment to produce the necessary accuracy resulted in the scrapping of a number of parts, so decided that the solution should be found in the use of a small filing-rest. Since making it, other uses such as the filing of the flats on D-bits have been found for it. In addition, it should prove useful on producing some cams, where eccentric turning is not possible. That described was designed to fit the Adept lathe, but could readily be modified to suit similar lathes, or, by increasing the dimensions, could be applied to much larger lathes.

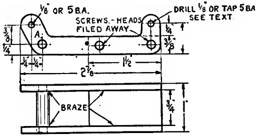


Fig. 1. Frames

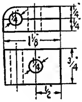


Fig. 2. Clamp blocks

Constructing the Side Frames

Fig. 1 illustrates the side frames of the appliance as made. These consist of two plates, sawn and filed from 1 in. × 1/8 in. mild-steel. The upper pair of holes in each plate vary in size, those in the left-hand plate being drilled and tapped 5-B.A., while those in the other are 1/8 in., but none of them were drilled until the whole had been assembled, as it was felt that this would assure greater accuracy and enabled the rollers to be set parallel to the base. These plates were screwed to a block of mild-steel 1 1/2 in. × 3/4 in. × 3/8 in. Through the holes shown in the lower left-hand corner of the plates is fitted a piece of mild-steel rod 1/4 in. diameter, shouldered down to 3/16 in. for 1/8 in. at each end. The whole was then silver-soldered and the protruding screw heads filed down flush with the frames to improve the appearance of the rest. The two 1/8-in. holes were then drilled at the top of the right-hand plate and the drill pushed through to lightly countersink the other plate, which was then drilled and tapped 5-B.A., for the roller pins, made from 1/8 in. silver-steel, screwed 5-B.A., for 1/8 in. Each of the rollers was made from 3/4 in. of 3/8 in. mild-steel, by drilling a 1/8-in. hole right through it. After case-hardening the rollers, the holes were lapped out to fit neatly on the pins. The silver-steel which I had was obtained from a welder and was slightly over 1/8 in., but that helped me to produce a better fit in the rollers. (I regret that I cannot give the actual size.) The rollers also, could have been made from silver-steel and hardened—a necessary precaution if it is desired to avoid untidily knurling them the first time they are used.

The Clamping Blocks

The clamping blocks were made from two pieces of mild-steel 1 in. × 3/4 in. × 1/4 in. sweated together for ease in machining. A 1/4-in. hole was drilled across the block at the junction, 1/4 in. from one end, and another was drilled through the block 1/2 in. from the other end. The parts were separated and cleaned up with the file, sufficient being removed from the adjacent surfaces to allow the blocks to securely clamp the 1/4-in. rod between the frames, when bolted together. The top block was rounded off to clear the back roller.

To use the rest, the top slide is removed from the lathe and the rest is clamped down in its place, with the end *A*, Fig. 1, nearer the operator, and the rollers parallel to the lathe axis. The height is adjustable by rocking the front up or down as required, the final adjustment being made by means of the cross slide feeding inwards to reduce the height of the cut. Slight tapers may be filed by slewing the whole rest around to the right or the left according to the direction of the taper. A set of tapered rollers would increase the usefulness of the rest, but may be made as required. The writer has considered making a pair of rollers with a shoulder on each, to guide the safe edge of the file, for producing work where each of the flats should be of the same length.

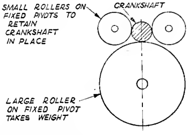
Editor's Correspondence

Lathe Treadle Design

DEAR SIR,—I would like to thank Mr. Dyer for his most interesting letter; it is good to see his name in your pages again, for his writings in the past have always been full of interest and sound practical common sense: I know, from outside sources, something of Mr. Dyer's reputation as a craftsman in sheet metal in particular.

With reference to Mr. Dyer's facts, I agree with all of them, but it seems to me he has overlooked one most important point.

He states that the desirable rise and fall of the treadle should be of the order 3 in. to 5 in.—this range is, I think, perfectly sound—a tall, long-legged individual will be comfortable with a



longer stroke than a short tubby one. This then is the crux of the matter; from say, a 5 in. stroke of the foot, we have to transfer power to the crank of the treadle shaft, and it doesn't matter in the least what the proportions of the levers, including the crank arm, are to accomplish this. Assuming that the operator is capable of applying a steady pressure of 56 lb. on the downward stroke (the figure is purely empirical) then at each stroke there is available 280 inch pounds of kinetic energy, and whether that is transmitted through a short lever and short crank or a long lever and a long crank, frictional conditions being equal, makes not the slightest difference to the ultimate result!

Thus, in the actual case under discussion, several things could have been done: (*a*) The fulcrum of the treadle could have been carried further back (the head of the vertical arm of the existing arrangement already swings 7 in. beyond the end of the horizontal arm, so it is not a case of saving space), (*b*) the throw of the crank could have been reduced, (*c*) a combination of (*a*) and (*b*) could have been arranged.

With regard to Mr. Dyer's point about raising the standing foot to the level of the top of the treadle bar when "down," this is a great fatigue saver and not as well known as it deserves; as a matter of fact, it is only a few weeks back that you published a letter of mine calling attention to this very point.

Referring to Mr. Dyer's comments on filing in the lathe, I agree 100 per cent. and I have known and do know quite a few professional turners who would agree equally heartily.

Finally, Mr. Dyer refers to the Milnes treadle gear having silent chain drive to the cranks. According to an illustration in an old copy of THE MODEL ENGINEER the chains used were flat multi-link chains such as are not infrequently found connecting balance weights and the part to be balanced on machine tools, and not inverted tooth type of chain usually known as the "Silent" chain. This form of treadle drive is extremely sweet and free running, particularly if the crankshaft is mounted in the fine old-fashioned way shown in the sketch—much too expensive to find favour in these progressive and enlightened times.

Yours faithfully,

Wealdstone. K. N. HARRIS.

Episcopic Projection

DEAR SIR,—Having carried out considerable experimental work with projection apparatus, I was very interested in the article in a recent issue of THE MODEL ENGINEER by Mr. F. Mitchell on the making and operation of an episcope.

I can endorse, fully, everything he says as to the usefulness of the apparatus and would like to amplify his remarks on rear projection.

The episcope being, as he says, a short-throw instrument and, consequently, operating best with a wide-angle lens, is particularly suited to rear projection. The seating arrangement, however, which Mr. Mitchell shows in his Fig. 7 is not ideal. There is an important rule which should be observed—the audience should be seated within the light beam of the projector. If the lines of the light beam in Fig. 7 are extended over the audience, it will be found that more than half are seated outside the beam; these people will see a dull picture and one of varying intensity

It is a simple matter to determine the area of the seating. The projector is set up and a picture focused on the screen. The screen is then temporarily removed but the screen frame retained in position. Wherever the light falls on the floor, good visibility is assured and seating can be arranged.

There is one further point—the apparatus should be set up at a higher level than would be normal for front projection, and the beam should be tilted downward slightly; the centre of the beam should strike about the centre of the audience.

As to suitable material for rear projection, the more transparent the better. It must, however, be sufficiently opaque to prevent the bright core of light at the lens being visible through the screen. In this respect the episcope is more suitable for rear projection than a film strip or cine projector, for a reflected and diffused beam is thrown and not the direct beam from the lamp.

For colour projection, tracing linen will probably be found better than tracing paper, for the slight blue tinge in the linen acts as a colour corrector to offset the yellow, of which there is a noticeable trace in even the whitest of filament lamps.

With correct placing of the audience, careful alignment of the light beam and selection of suitable screen material, remarkably efficient

results can be obtained with rear projection—in the order of six times the brilliance of normal front projection.

Yours faithfully,
H. S. COLEMAN.
London, S.W.1. Modelcraft Ltd.

Cutting Coarse Spirals

DEAR SIR,—With reference to the frequent correspondence on lathe design, I have an old model George Adams 4-in. universal lathe with a cylindrical bed, wide vee underneath and adjustable wedge. Having been loaned an instruction book on the machine, here are some interesting extracts :—

" Now, in this construction of lathe, with such a rigid slide rest having such a large bearing surface and with the true central pull of the lead screw, it is possible to cut very much coarser screws or spirals with a single-point tool than on any other type of lathe. On the ordinary flat bed type lathe the tendency of the saddle when traversing is to skew and jamb in the V's.

" In a bed with V-shaped guides the bearing surface, as between the sides of the V's on the bed and the corresponding V grooves in the bed slide, is so small ; also, the pull of the lead screw at a point so far away from the point of the tool, as to preclude all possibility of cutting a coarse pitch screw. On this lathe it is possible to cut any spiral, if not by the headstock drive it can be cut quite quickly by the hand-feed. Exactly where the headstock no longer transmits power enough to satisfactorily traverse the slide through the quadrant change wheels is difficult to state, but with the slide widely adjusted and the bed oiled 1 in. pitch, i.e., one turn in 1 in. should be cut very well, which is quite a heavy pitch for a 4-in. lathe. Beyond this the lead screw must be driven by hand, and where no overhead or milling appliance is available a single-point tool has to be used. We have easily cut in this way, by hand, a gunmetal V-shaped worm with three starts, $1\frac{1}{2}$ in. spiral pitch, i.e., one turn in $1\frac{1}{2}$ in., length of worm $3\frac{1}{2}$ in., diameter $1\frac{1}{2}$ in. This took from start to finish five hours, and in spite of the size of the cut was a beautifully finished job, without any trace of chatter."

I believe Messrs. Smart & Brown now make a 4-in. lathe with the central lead screw and they speak well of this position.

Yours faithfully,
Falmouth. HAROLD V. EDDY.

Club Announcements

Orpington Model Engineering Society

The above society will hold an extra meeting in July, on the 26th, at 7.30 p.m., at 68, Wellington Road, Orpington. The main purpose of the meeting is to discuss the stewards' duties and any other last-minute details concerning the South-Eastern Association's Model Engineer Exhibition at Bromley, commencing August 5th.

The society's monthly meeting for August will be at 10.30 a.m. on Sunday, August 8th, in the grounds of this exhibition, at the Boys' County School, Hayes Lane, Bromley, Kent.

Hon. Secretary: R. CLUSE, 57, Towncourt Crescent, Petts Wood.

Scunthorpe Society of Model Engineers

The above society has preparations well in hand for the opening of the second exhibition by the Mayor of Scunthorpe, Councillor W. H. Pulling, on Saturday, July 24th, at 3 p.m., in the Doncaster Road Schools. Over 300 models of locomotives, engines, ships, aeroplanes, and many old-time engines will be displayed.

Other attractions are the popular passenger-carrying railway, which has now been extended by the members to make a continuous track of 100 yards of double gauge.

A model engineer's workshop will be an innovation; this will be operated throughout the week, all machines and equipment being transferred to the exhibition from the society's workshop for the show period—10 a.m. to 10 p.m. daily until July 31st.

Hon. Secretary: D. P. NASH, 70, Exeter Road, Scunthorpe.

Stockport and District Society of Model Engineers

Owing to the Stockport holidays, there will be no meeting on August 6th.

August 20th will be a " Bits and Pieces " evening.

Meetings are held on the first and third Fridays each month at the Dyers' and Bleachers' Club, Teviot Dale, Stockport, at 8 p.m. Visitors welcome.

Hon. Secretary: G. Lindsey, 292, Bramhall Lane South, Bramhall, Stockport. (Phone: Bramhall 58.)

The Faversham and District Model and Experimental Engineering Society

A visit to the paper mill of Edward Lloyd Ltd., at Sittingbourne, has been arranged for the evening of the next meeting on July 29th. The coach will leave headquarters at 6.30 p.m., and all members who were not at the last meeting and wish to come should give their names in to the secretary as soon as possible.

The talk on " Lathe Attachments " which Mr. Osmond was to have given has been postponed until a later date.

Headquarters: The Club Room, at the rear of the Brewers Inn, The Mall, Faversham, Kent.

Hon. Secretary: R. W. PARTIS, 14, Edith Road, Faversham, Kent.

Perranporth and District Model Engineering Society

The above society is now holding an exhibition of models in St. Michael's Hall, Perranporth, until July 27th.

Help is being given from the model clubs at Plymouth, Falmouth, Newquay and the S.M.E.E., to which the above club is affiliated.

Hon. Secretary: W. J. BAKER, Post Office, St. Piran's Road, Perranporth.

South Eastern Association of Model Engineers

The final meeting before the exhibition at the Boys County Grammar School, Hayes Lane, Bromley, August 5th to 14th, will be held at Crantock Road, Catford, S.E.6, on Tuesday, July 27th.

While no high speeds will be possible on the 75 ft. dia. race car track in the school playground, it is hoped that all racing car clubs will send representatives with cars. They will be very welcome to run cars during the exhibition.

Hon. Secretary: W. R. COOK, 103, Engleheart Road, Catford, S.E.6.

NOTICES

The Editor invites correspondence and original contributions on all small power engineering and electrical subjects. **All such correspondence should be addressed to the Editor (and not to individuals)** at 23, Great Queen Street, London, W.C.2. Matter intended for publication should be clearly written, and should invariably bear the sender's name and address.

Readers desiring to see the Editor personally can only do so by making an appointment in advance.

All correspondence relating to sales of the paper and books to be addressed to THE SALES MANAGER, Percival Marshall & Co. Ltd., 23, Great Queen Street, London, W.C.2.

Correspondence relating to dislpay advertisements to be addressed to THE ADVERTISEMENT MANAGER, " The Model Engineer," 23, Great Queen Street, London, W.C.2.